

# **AERONAUTICAL AND ASTRONAUTICAL ENGINEER**

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## **PROPAGATION OF A TWO-PHASE DETONATION ACROSS A GEOMETRIC DIFFRACTION WITH COMPOSITIONAL DISCONTINUITY**

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The research program involved the modification and use of an existing pulse detonation engine (PDE) to investigate the detonability of a JP-10/air aerosol. The detonation of a JP-10 aerosol in air proved more difficult than was originally anticipated.

The use of a small JP-10/oxygen pre-detonator to provide direct initiation results in a transition region with a geometric diffraction and compositional discontinuity. Propagation of a detonation into such a region is very complex but critical to the re-establishment of the detonation wave in the JP-10/air mixture. A high-speed camera was used to image the wave in the transition region and provide spatial information. High frequency pressure transducers were used along the combustor axis to determine wave speed. The ultimate goal was to determine the conditions required to ensure reliable re-establishment of a detonation wave in the JP-10/air aerosol mixture.

Unfortunately, the confined planar JP-10/oxygen detonations in the pre-detonator were unable to transition into unconfined spherical detonation fronts in the JP-10/air aerosol. Furthermore, the ratio of main combustor diameter to pre-detonator diameter was too large to allow re-initiation of detonation at the main combustor wall.

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